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CAPITAL INVESTMENTS OF THE WORLD PETROLEUM INDUSTRY

Capital Investments of the World Petroleum Industry 1987

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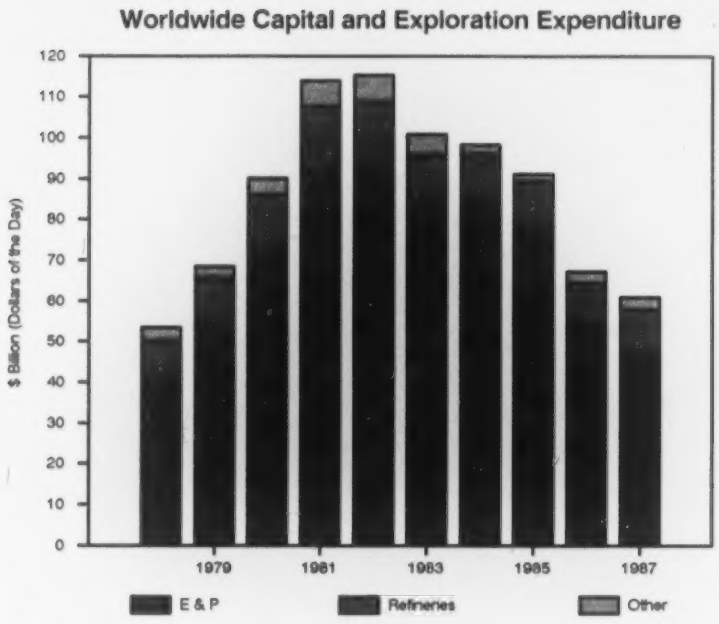
Foreword

This marks the thirty second consecutive year in which The Chase Manhattan Bank has published its estimates of capital spending in the world petroleum industry. Over this period worldwide spending has grown from just over $8 billion in 1955 to a peak of $115 billion in 1982 and has subsequently declined to $61 billion in 1987. The focus of this edition is on one of the most tumultuous decades of this period, the interval from 1978 through 1987. During these ten years significant shifts in relative spending patterns from region to region and within regions have occurred as energy prices rose and fell.

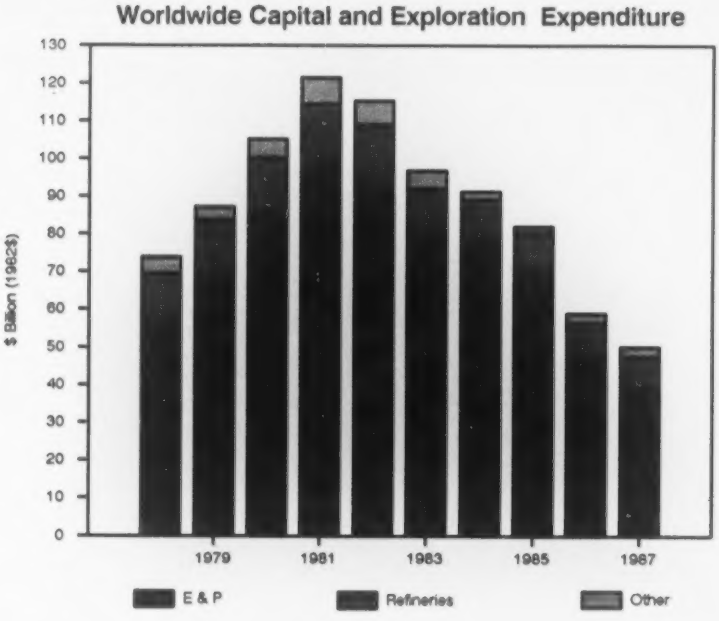
As noted in last year's edition, Chase now relies largely on data provided by governmental agencies, industry associations and state-sponsored energy concerns. Although confidential multinational oil companies information is used to estimate certain categories, exploration and production spending, which accounts for the greatest portion of total expenditure, is derived mainly from public sources.

Since government data are normally not available until 18 months after the close of the year, the current booklet presents expenditures through 1987. Unless otherwise indicated, all figures presented in this booklet are in nominal United States dollars. All spending estimates exclude expenditures in the Centrally Planned Economies of Eastern Europe, the Soviet Union and the People's Republic of China.

Graph 1



Graph 2



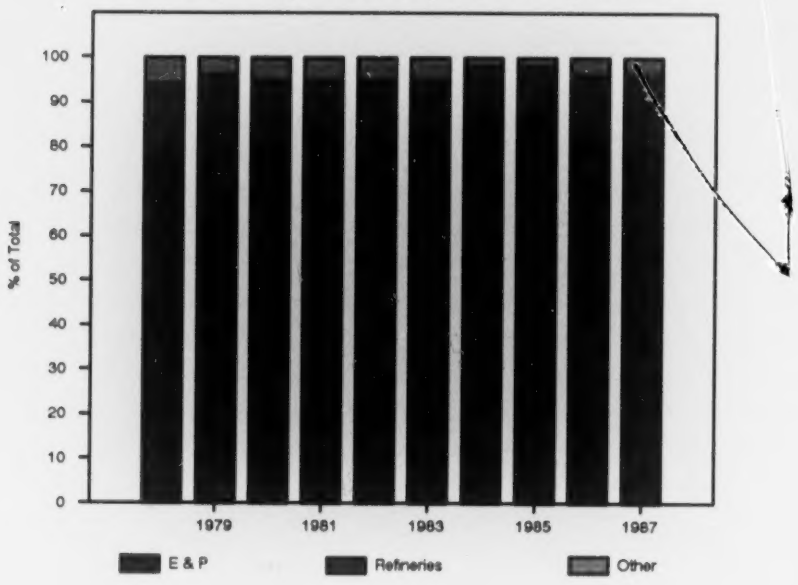
Worldwide Capital and Exploration Expenditures

Over the ten year period from 1978 through 1987, worldwide capital spending in the petroleum industry rose from $53 billion in 1978 to a peak of $115 billion in 1982 and then collapsed with energy prices to to under $70 billion in 1986-1987 (See Graph 1). The magnitude of the recent drop in capital spending is more startling when expenditures are translated into real dollars as shown in Graph 2. In real terms 1987 spending is barely 70% of 1978 levels and less than 40% of levels achieved at the peak of the energy boom in 1981. To some extent this decline is offset by an increase in capital efficiency; finding and development costs per barrel equivalent are significantly below the levels of the boom years as producers focus on developing lower cost reserves and devise innovative methods to pare capital expenditures. Despite this improvement in investment efficiency, however, the drop in capital spending is an indication of the upheaval in the petroleum industry over the past few years including the consolidation of energy companies, the reductions in work force and the financial distress experienced by many small companies, particularly those in the drilling and service segment.

For analytic purposes, worldwide spending can be broken into three groups as shown in Graph 3: Exploration and Production, Refineries and Other. Exploration and production expenditure has historically dominated petroleum spending, composing between 75 to 85 percent of the total. Expenditure trends in this category are described in more detail in the next section.

Graph 3

Distribution of
Worldwide Capital and Exploration Expenditure

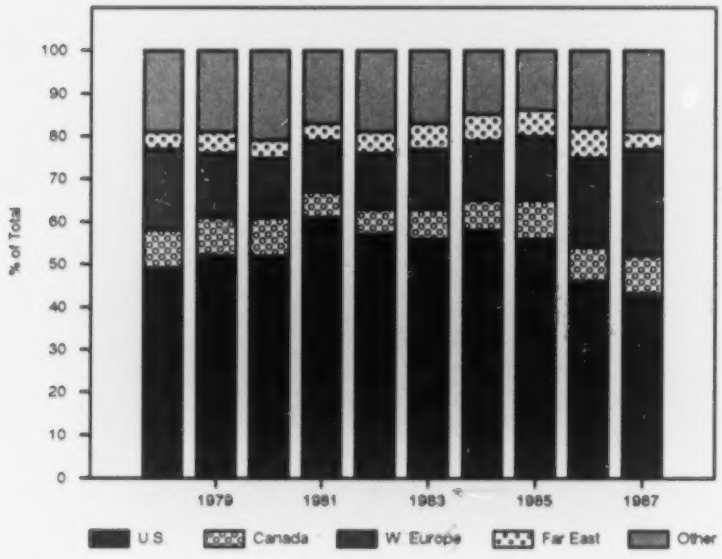


The percentage of capital expenditure devoted to the refining sector reflects both major investment programs to upgrade refineries to produce lighter product from heavier crude slates and capital spending required by governments to meet stricter environmental standards for petroleum products. In 1979 capital spending in refineries hit a peak of 18 percent of total worldwide spending as refiners, particularly in the United States, invested in catalytic cracking and coking units to handle heavier crudes from OPEC nations and still meet surging gasoline demand. Following this period, refinery capital spending fell in relative terms but has recently increased to 17 percent of total expenditures in 1987. This current increase is due both to the upgrading of refineries in Western Europe and modification of facilities in United States refineries to meet stricter product specifications. In view of the continued tightening of product standards, it is likely that refinery spending will claim a larger portion of total capital spending in the industry in the years ahead.

Spending in other categories is principally composed of expenditures for tankers and LNG facilities. A ten year low in this category was achieved in 1984-1985 when both tanker spending and investment in LNG plants declined sharply. While tankers spending has only recovered modestly from these low levels, LNG spending has increased largely due to the Australian Northwest Shelf project which is scheduled for start-up in 1989.

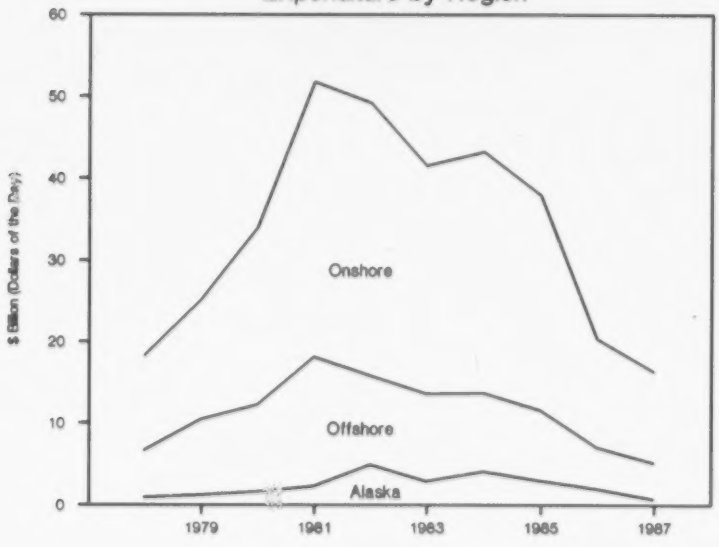
Graph 4

Worldwide Exploration and Production Expenditure by Region



Graph 5

U.S. Exploration and Production Expenditure by Region



Worldwide Crude Oil and Natural Gas Expenditures

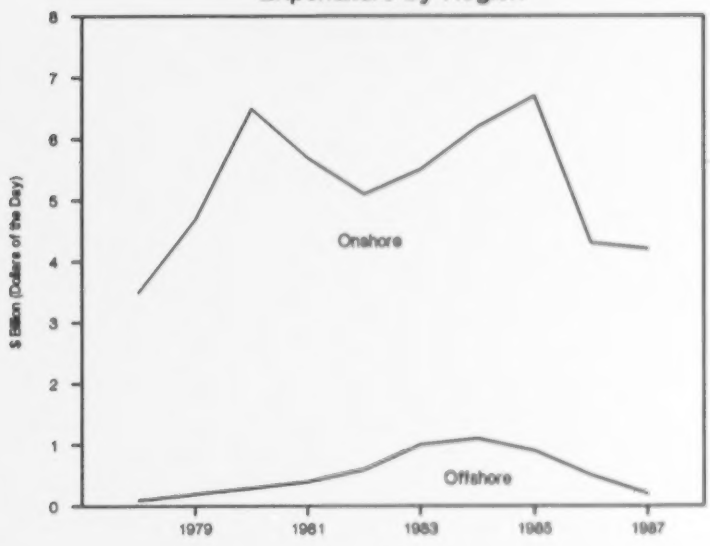
Since capital spending for exploration and production has historically accounted for 75 to 85 percent of total expenditures, a brief review of major regional trends within this category is in order.

Although real capital spending in all geographic regions has declined from peaks achieved in the early 1980's, nowhere has the economic cycle of the upstream industry been better illustrated than in the United States. Spending in the United States rose from about half of worldwide expenditures in 1978 to over 60 percent in 1981 and has fallen to a ten year low of 43 percent in 1987 (See Graph 4). With the most mature geologic basins and the highest operating and finding costs, the United States was the country most affected by the change in energy price expectations. Contributing to this decline in spending are financially weakened independent producing companies who can no longer support aggressive capital programs, individual investors who have lost both tax benefits from and their appetite for oil and gas drilling funds, and well financed multinationals who have shifted spending out of the United States. As shown in Graph 5, the most mature producing area, onshore, has borne the brunt of this downturn in capital spending.

In Canada, spending has been significantly influenced by government policies. In contrast to the United States, Canadian spending as a percent of worldwide expenditures fell from nine percent in 1978 to six percent at the peak of energy boom and has recovered to nine percent only in the last few years despite flagging energy prices. No doubt, the disagreement in the early 1980's between the federal government and the provinces over energy policies and taxation contributed to the relative decline in investment. With these disputes largely resolved, price controls eliminated, and the institution of spending incentives restored, Canadian expenditures have increased in relative terms.

Graph 6

Canadian Exploration and Production
Expenditure by Region



In the United States and Canada, investment shifts into and out of high cost, high risk regions are significant. In the United States, spending in the frontier areas of Alaska rose from under $1.0 billion in 1978 to a peak of $4.9 billion in 1982 and to a ten year low of $0.8 billion in 1987 (See Graph 5). Likewise in Canada, Graph 6 shows the rise and fall of offshore spending.

Western European spending, mainly in the North Sea failed to keep up with the frantic pace set by the United States in the boom years, but has increased its relative position since the 1986 price collapse and, in 1987, commanded a record one quarter of worldwide spending. Again, tax incentives to keep development economically attractive despite lower prices have played a large part in maintaining nominal spending levels in this region.

In the Far East, spending has varied in a range of four to seven percent of total worldwide expenditures throughout this period. Dominated by Indonesian and Australian investment, this region has experienced the same relative growth and decline as the in-

dustry in general. Recent investment weakness, however, has largely been the result of a pronounced decline in drilling activity in India as the Bombay High projects reach completion.

In other regions, spending is largely a function of government controlled oil entities and, therefore, has been as much affected by governmental financial constraints as energy market forces. The sharp decline in Mexican expenditures in 1981 through 1982 is an example of how government financial policies affect oil industry spending.

Definitions of Investment Categories

The focus of this annual report is investment in the worldwide oil and gas industry. Consequently, investments in other energy resources such as coal, nuclear, or other minerals are excluded. Within the oil and gas industry, funds expended for the acquisition of existing petroleum assets from another enitity are not included since the initial expenditures for such assets have been recorded in earlier year investment totals.

For analytic purposes, the industry is divided into five segments:

Crude Oil and Natural Gas

Included in this category are expenditures for the exploration and development of oil and gas reserves. Estimates include both capitalized investments as well as expensed items such as dry hole expenses, intangibles, and some general and administrative expenses associated with upstream activities. Excluded are investments in the the transporting, marketing and distribution of natural gas.

Natural Gas Liquid Plants

This category encompasses expenditures for the construction and maintenance of processing plants designed to extract liquids from natural gas.

Liquified Natural Gas (LNG) Plants

Investments in the development of gas reserves, the capital maintenance and construction of LNG plants and transportation of LNG to the point of tanker loading are included in this category. Not included are investments in LNG tankers, LNG re-gasification plants and subsequent distribution of gas.

Tankers

This category includes investment in crude oil tankers only.

Refineries

This category is limited to capital investment in the construction and maintenance of refineries only. Expenditures in the marketing and distribution of products outside the refinery gate are not reflected in the totals for this category.

1 Capital and Exploration Expenditures 1978 - 87

	1978	1979	1980
		($ million)	
World	53,380	68,600	90,240
Crude Oil and Natural Gas	41,000	53,030	72,100
Natural Gas Liquids Plants	520	710	1,020
Refineries	8,790	12,220	13,010
Liquified Natural Gas (LNG) Plants	120	390	710
Tankers	2,950	2,250	3,400
North America	30,440	41,920	55,930
Crude Oil and Natural Gas	26,330	35,410	49,710
Natural Gas Liquids Plants	520	710	1,020
Refineries	3,590	5,800	5,200
United States	22,110	30,490	40,990
Crude Oil and Natural Gas[1]	20,030	27,410	36,990
Onshore Lower 48	11,640	14,690	21,750
Offshore Lower 48	5,710	9,200	10,550
Alaska	890	1,210	1,550
Natural Gas Liquids Plants	330	450	750
Refineries	1,750	2,630	3,250
Canada	4,100	5,370	7,220
Crude Oil and Natural Gas	3,490	4,700	6,460
Offshore	80	200	300
Onshore	3,410	4,500	6,160
Natural Gas Liquids Plants	190	260	270
Refineries	420	410	490
Mexico	4,230	6,060	7,720
Crude Oil and Natural Gas	2,810	3,300	6,260
Refineries	1,420	2,760	1,460

[1]Components may not equal United States totals due, to estimation techniques employed in the U.S. Department of Commerce/A.P.I. surveys.

1981	1982	1983	1984	1985	1986	1987
			($ million)			
114,100	115,370	100,860	96,500	91,000	67,280	61,070
90,700	91,410	83,160	83,900	77,370	54,470	47,020
1,220	1,800	810	850	860	510	740
15,880	15,860	12,010	11,580	11,190	9,490	10,420
1,350	2,030	580	120	590	1,230	1,380
4,950	4,270	4,300	2,050	990	1,580	1,510
72,690	67,680	59,190	64,020	59,470	36,110	30,260
64,230	58,820	53,070	57,550	52,430	31,210	25,690
1,220	1,800	810	850	860	510	740
7,240	7,060	5,310	5,620	6,180	4,390	3,830
60,260	58,940	50,660	51,770	47,350	27,630	22,720
54,730	52,210	46,260	48,060	43,640	24,830	19,760
33,700	31,380	28,030	29,590	26,370	13,310	11,160
15,840	10,880	10,730	9,560	8,620	5,050	4,420
2,270	4,920	2,930	4,070	2,950	2,020	820
930	1,380	650	680	610	350	600
4,600	5,350	3,750	3,030	3,100	2,450	2,360
6,900	6,740	6,600	6,920	7,380	4,980	5,010
5,660	5,070	5,550	6,180	6,690	4,320	4,180
390	610	1,030	1,080	910	510	170
5,270	4,460	4,520	5,100	5,780	3,810	4,010
290	420	160	170	250	160	140
950	1,250	890	570	440	500	690
5,530	2,000	1,930	5,330	4,740	3,500	2,530
3,840	1,540	1,260	3,310	2,100	2,060	1,750
1,690	460	670	2,020	2,640	1,440	780

1 Capital and Exploration Expenditures 1978 - 87 (continued)

	1978	1979	1980
		($ million)	
Western Europe	10,210	10,700	13,830
Crude Oil and Natural Gas	7,710	8,180	10,450
North Sea Exploration	860	990	1,970
North Sea Development	6,110	6,270	7,410
Other	740	920	1,070
Refineries	2,500	2,520	3,380
Central & South America	3,700	4,940	6,050
Crude Oil and Natural Gas	2,950	3,890	4,760
Brazil	960	1,180	1,390
Colombia	110	180	230
Venezuela	690	1,050	1,470
Other	1,190	1,480	1,670
Refineries	750	1,050	1,290
Far East & Australasia	3,200	4,570	5,640
Crude Oil and Natural Gas	1,760	2,430	3,080
Australia	280	500	680
Indonesia	660	750	1,260
Other	840	1,180	1,140
Refineries	1,410	1,750	1,850
Japan	900	1,080	960
Other	510	670	890
Liquified Natural Gas (LNG) Plants	120	390	710
Middle East & Africa	2,790	4,220	5,390
Crude Oil and Natural Gas	2,250	3,120	4,100
Refineries	540	1,100	1,290

1981	1982	1983	1984	1985	1986	1987
			($ million)			
13,950	14,490	14,010	13,820	13,270	13,030	14,760
10,880	11,890	11,980	12,100	11,620	11,550	12,030
2,360	2,960	2,880	3,180	3,380	2,810	2,580
7,470	7,730	8,020	7,830	7,070	7,540	8,170
1,050	1,200	1,080	1,090	1,170	1,200	1,300
3,070	2,600	2,050	1,720	1,650	1,480	2,730
8,410	10,640	8,140	5,730	5,760	5,690	5,230
6,830	8,930	6,920	4,750	4,910	4,870	4,430
2,560	3,580	2,460	1,690	1,680	2,090	2,160
320	380	280	290	500	200	250
2,130	3,120	2,570	1,410	1,350	1,310	870
1,820	1,850	1,610	1,360	1,380	1,270	1,150
1,580	1,710	1,220	980	850	820	800
7,550	9,330	7,370	6,600	6,510	6,770	5,520
3,940	5,040	5,240	4,970	4,400	3,680	2,100
980	1,350	1,180	1,270	1,230	730	540
1,460	1,720	1,480	1,290	1,180	970	580
1,500	1,970	2,580	2,410	1,990	1,980	980
2,280	2,260	1,550	1,510	1,520	1,860	2,040
1,120	860	630	600	610	1,000	1,180
1,140	1,400	920	910	910	860	860
1,350	2,030	580	120	590	1,230	1,380
6,550	8,960	7,850	6,280	5,000	4,100	3,790
4,820	6,730	5,970	4,530	4,010	3,160	2,770
1,730	2,230	1,880	1,750	990	940	1,020

2 Capital and Exploration Expenditures 1985-1987

	Crude Oil and Natural Gas ($ million)			Refineries ($ million)		
	1985	1986	1987	1985	1986	1987
World	**77,370**	**54,470**	**47,020**	**11,190**	**9,490**	**10,420**
North America	52,430	31,210	25,690	6,180	4,390	3,830
United States[1]	43,640	24,830	19,760	3,100	2,450	2,360
Onshore Lower 48	26,370	13,310	11,160	–	–	–
Offshore Lower 48	8,620	5,050	4,420	–	–	–
Alaska	2,950	2,020	820	–	–	–
Canada	6,690	4,320	4,180	440	500	690
Mexico	2,100	2,060	1,750	2,640	1,440	780
Western Europe	**11,620**	**11,550**	**12,030**	**1,650**	**1,480**	**2,730**
North Sea	**10,450**	**10,350**	**10,730**	**–**	**–**	**–**
Other	**1,170**	**1,200**	**1,300**	**–**	**–**	**–**
Central & South America	4,910	4,870	4,430	850	820	800
Brazil	1,680	2,090	2,160	n/a	n/a	n/a
Colombia	500	200	250	n/a	n/a	n/a
Venezuela	1,350	1,310	870	n/a	n/a	n/a
Other	1,380	1,270	1,150	n/a	n/a	n/a
Far East & Australasia	**4,400**	**3,680**	**2,100**	**1,300**	**1,700**	**2,040**
Australia	**1,230**	**730**	**540**	**45**	**40**	**n/a**
Indonesia	**1,180**	**970**	**580**	**n/a**	**n/a**	**n/a**
Japan	**120**	**70**	**70**	**610**	**1,000**	**1,180**
Other	**1,870**	**1,910**	**910**	**865**	**820**	**860**
Middle East & Africa	4,010	3,160	2,770	990	940	1,020

[1]Components may not equal United States totals due, to estimation techniques employed in the U.S. Department of Commerce/A.P.I. surveys.

3 Percent Change In Capital and Exploration Expenditures 1985 - 87

	Crude Oil and Natural Gas			Refineries		
	85/84	86/85	87/86	85/84	86/85	87/86
World	-6%	-30%	-14%	-3%	-15%	10%
North America	-9%	-40%	-18%	10%	-29%	-13%
United States	-9%	-43%	-20%	2%	-21%	-4%
Onshore Lower 48	-11%	-50%	-16%	–	–	–
Offshore Lower 48	-10%	-41%	-12%	–	–	–
Alaska	-28%	-32%	-62%	–	–	–
Canada	8%	-35%	-3%	-23%	14%	38%
Mexico	-37%	-2%	-15%	31%	-45%	-46%
Western Europe	-4%	-1%	4%	-4%	-10%	84%
North Sea	-5%	-1%	4%	–	–	–
Other	7%	3%	8%	–	–	–
Central & South America	3%	-1%	-9%	13%	30%	-2%
Brazil	-1%	24%	3%	–	–	–
Colombia	72%	-60%	26%	–	–	–
Venezuela	-4%	-3%	-33%	–	–	–
Other	1%	-8%	-9%	–	–	–
Far East & Australasia	-11%	-16%	-43%	-1%	22%	20%
Australia	-3%	-41%	-26%	-25%	-11%	275%
Indonesia	-9%	-18%	-40%	–	–	–
Japan	-54%	-42%	0%	2%	64%	1%
Other	-17%	-1%	-52%	2%	-5%	-9%
Middle East & Africa	-11%	-21%	-12%	-43%	-5%	9%

4 United States Crude Oil and Natural Gas Expenditures[1]

	1978	1979	1980
		($ million)	
United States – Total	20,030	27,410	36,990
Exploration	9,460	15,620	20,630
Lease Acquisition	3,080	7,270	8,170
Drilling	4,140	5,620	8,680
Other	2,240	2,730	3,980
Production	10,570	11,790	16,160
Drilling	6,840	7,970	10,190
Production Equipment	2,180	2,150	3,570
Other	1,550	1,670	2,400
Onshore Lower 48	11,640	14,690	21,750
Exploration	5,410	7,390	11,240
Lease Acquisition	1,480	2,290	3,290
Drilling	2,880	3,850	6,100
Other	1,050	1,250	1,850
Production	6,230	7,300	10,510
Drilling	4,660	5,540	7,480
Production Equipment	1,030	1,250	2,120
Other	540	510	910
Offshore Lower 48	5,710	9,200	10,550
Exploration	2,900	6,230	7,230
Lease Acquisition	1,580	4,360	4,490
Drilling	1,090	1,650	2,400
Other	230	220	340
Production	2,810	2,970	3,320
Drilling	1,990	2,170	2,370
Production Equipment	750	780	950
Other	70	20	0
Alaska	890	1,210	1,550
Exploration	270	810	680
Lease Acquisition	20	610	370
Drilling	170	120	180
Other	80	80	130
Production	620	400	870
Drilling	190	270	340
Production Equipment	400	120	510
Other	30	10	20

[1]Components may not equal United States totals, due to estimation techniques employed in the U. S. Department of Commerce/A.P.I. surveys.

1981	1982	1983	1984 ($ Million)	1985	1986	1987
54,730	52,210	46,260	48,060	43,640	24,830	19,760
30,680	27,860	21,090	21,500	16,400	8,470	7,590
13,060	8,620	8,370	8,190	4,420	1,840	1,910
13,550	12,940	7,050	7,360	6,300	3,060	2,370
4,070	6,300	5,670	5,950	5,680	3,780	3,310
24,050	24,350	25,170	26,560	27,240	16,360	12,170
16,110	15,580	18,340	18,690	17,410	9,260	7,360
4,760	5,140	3,700	4,500	5,030	3,530	2,310
3,180	3,630	3,130	3,370	4,800	3,570	2,500
33,700	31,390	28,030	29,590	26,370	13,310	11,160
17,440	15,910	9,420	10,140	8,920	4,510	3,860
5,060	4,460	3,530	3,740	2,880	1,310	1,270
9,760	8,680	3,580	3,980	3,800	1,900	1,480
2,620	2,770	2,310	2,420	2,240	1,300	1,110
16,260	15,480	18,610	19,450	17,450	8,800	7,300
12,360	11,820	15,820	16,280	14,080	6,460	5,440
2,530	2,440	1,880	2,480	2,000	1,460	1,270
1,370	1,220	910	690	1,370	880	590
14,840	10,880	10,730	9,560	8,520	5,050	4,420
10,480	6,420	6,020	6,460	4,150	1,810	1,850
4,490	6,490	2,030	4,390	2,850	1,490	820
3,430	3,860	3,110	3,060	2,150	1,150	890
560	540	520	550	510	390	340
4,360	4,460	2,710	3,100	4,470	3,240	2,570
2,950	3,200	2,060	2,030	2,820	2,150	1,800
1,410	1,260	590	980	1,570	1,030	870
0	0	60	90	80	60	100
2,270	4,920	2,930	4,070	2,950	2,020	820
650	2,920	1,150	2,190	610	130	270
20	2,130	450	1,600	50	50	30
350	410	350	330	350	0	170
280	380	350	260	210	80	70
1,620	2,000	1,780	1,880	2,340	1,890	550
790	570	450	380	510	650	310
830	1,430	1,240	1,040	1,460	1,040	170
0	0	90	460	370	200	70

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John R. Sorice, Associate
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Kerry C. Zochowski, Associate
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